

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XIX.

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Senelys annucleata Guen. The larva given by Guenée as that of this species does not agree at all with my observations. On the other hand, the one described by Goodell does agree well. As it seemed possible that there had been some mixture of species, I applied to Dr. Hulst, who states that he thinks the two forms of the moth probably distinct, as follows:—

1. Wings sordid white with faint brownish lines —

ENNUCLEATA Guen., Phal. i, 505; 1857.
= *restrictata* Walk. C. B. M. xxii, 722;
1861 = *mensurata* Walk. C. B. M. xxxv,
1621; 1866.

2. Wings with a more or less extensive blackish submarginal powdering —

ALABASTARIA Hübb. Zutr. ii, 22, fig. 311, 312. = *annucleata* var. Guen. Phal. pl. 12, fig. 3. = *annucleata* Pack (nec Guen.) Mon. 347, pl. 10, fig. 67. = *reconditaria* Walk. C. B. M. xxii, 786, 1861.

The moths bred from the larvae here described were of the form *annucleata* as defined.

Egg. Laid loosely, rolled about in the tumbler. Roundedly elliptical, one diameter less than the other, but without flattened areas, slightly more sharply rounded at the micropylar end; about 15 longitudinal, strongly prominent ribs with fine parallel cross-striae, slightly raised both across the ribs and in the interspaces. Ends confused reticulate, the ribs abruptly ending at the edge of the micropylar end, becoming merged in the reticulations at the other. Very pale green, almost white, not shining. Size .55 × .4 × .35 mm. (Eggs from Washington, D. C.)

Stage I. Long, slender, thread-like, ac-

tively looping. Head and cervical shield pale translucent reddish brown, the head round, slightly bilobed, ocelli black; width about .3 mm. Body dark brown above and below; the sides broadly translucent greenish. Thoracic feet pale, abdominal ones dark. Setae short and stiff, black, with swollen clearer tips. Later the subventral brown breaks up into a series of subventral streaks. The larvae remain long and slender.

Stage II. Head round, flattened before, not bilobed; width .4 mm. Body slender, the thorax short; smooth; ground color translucent sordid whitish, thorax with fine dark brown subdorsal line and a broader subventral one; abdomen with broad dorsal brown band tapering to a point on joint 13, leaving the sides and feet pale; a moderately broad subventral band, broken posteriorly.

Stage III. Head round, wider than high, antennae prominent; pale brown, dotted, a white streak on the face of each lobe edged with darker brown dots; width .6 mm. Body long and slender, cylindrical, smooth. Somewhat sordid green; thorax with a fine dorsal line which joins the broad abdominal dorsal band, reaching joint 3, contracted slightly at the incisures; a series of small round segmental spots subventrally, a line on the anterior edge of the foot of joint 10 and bases of thoracic feet dark purple brown. Setae short and stiff, dark. Skin finely transversely creased. Anal feet long, green. Tubercle i of head and angles of cervical shield a little prominent.

Stage IV. Head rounded, squarish, dull yellowish, speckled with brown; a bright shade, edged with brown without, on the face of each lobe; width .75 mm. Body very long and slender, finely annulated, dull

brownish yellow; dorsal line faint and obscure, scarcely darker than the ground except dorsally on joints 10 to 13, where it is dark and distinct, its border marked by dark dots intersegmentally (approximate), and centrally on the segments (remote). Thorax darkly shaded, the lines obsolescent. Venter a shade paler with series of subventral brown dashes edging the bases of the feet. Setae short, dark; tubercles obsolete; skin granular. Later a heavy black shade overspreads the posterior two-thirds of the venter, especially posteriorly, reaching the sides and finally the dorsum of joint 13 in one larva, but leaving the feet pale outwardly. Otherwise the larva is uniformly brown, finely annulate, the few dark brown dots obscure. Some of the larvae passed another molt about Sept. 14 with width of head .9 mm., and the same coloration; but most hibernated in this stage. They began feeding again April 30.

Stage V. Head rounded, rather strongly bilobed, ashen on the face, brown flecked, a broad diffuse band on each side of the median suture and a longer parallel one up each lobe before the ocelli to vertex; width 1.1 mm. Body ochraceous brown, shaded with black ventrally on joints 9 to 13, feet pale outwardly. Segments about 30-annulate. Traces of brown dorsal and subdorsal lines and black flecks near the incisures; also blackish shaded laterally posteriorly on the segments. Spiracles black; vi on a low rounded lump, most distinct on joints 5 and 6. Tubercles minute, setae short, black.

Stage VI. Head somewhat squarely rounded, free; whitish gray, mottled with brown, a broad, diffuse, mottled dark stripe from behind ocelli and a shorter one each side of median suture; width 1.6 mm. Segments about 30-annulate, cylindrical, uniform, slender, well drawn out; anal feet projecting laterally, the plate broad rounded at the end; shields all concolorous. Wood brown, ochraceous dorsally on joints 3 to 13, a diffuse red-brown dorsal line, becoming a

bluish white bar on the large first annulet. Black crinkly addorsal dashes anteriorly and posteriorly on each segment, the posterior ones a little more lateral and a little oblique. A diffuse, sparsely pulverulent, black stigmatal and subventral shading, heaviest and covering most of the venter of joints 8 to 10, but leaving the foot of joint 10 outwardly pale. Venter sparsely black irrorate. Thoracic feet pale. Spiracles black; tubercles and setae minute.

Larvae handed me by Mr. W. D. Kearfott from his collecting box, where they had hatched in July; moth the following June. Single brooded, hibernation in Stage IV. The larvae were raised on wild cherry and apple.

FOOD OF LARVAE OF SIMULIUM AND BLEPHAROCERA.—In making sections of the larvae of Simulium and Blepharocera, in a study of the post embryonic development of these flies, I have found a peculiar obstacle in the presence in the alimentary canal of hundreds of the tiny silicious shells of diatoms. From an examination of the alimentary canal of many specimens of Simulium and Blepharocera it is apparent that diatoms constitute a large part of the food of these larvae, both of which live clinging to the smooth rock beds of swiftly flowing streams. I have mentioned, in a paper in the Entomological News (January, 1900) the curious fact that the fully grown larvae of *Blepharocera capitata* are covered dorsally with a close growth of diatoms. The most abundant diatom in this growth was one of the stalked Gomphonema. The basis of this covering of the larva's back was the gelatinous mass at the base of the stalked diatoms. Scattered upon and through this mass were individuals of Nitzschia and several other diatomaceous genera. The covering had a soft, felt-like appearance, grayish or brownish, and did not seem to trouble the larva. I have found a similar diatomaceous growth on the larvae of *Liponeura* and two other Blepharocerid species in Cali-